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ABSTRACT

The course outline has been prepared as a guide to assist the instructor to plan systematically and to present meaningful lessons programmed to meet the necessary training needed by the machine shop student. A beginning course, the four blocks of instruction contained in the outline are designed to enable the student to obtain the manipulative skills and related knowledge necessary to understand and use measuring instruments and layout tools correctly, safely, and productively. The course consists of 135 clock hours. A three-page bibliography is included, and a posttest with answer key is appended. (Author/AJ)

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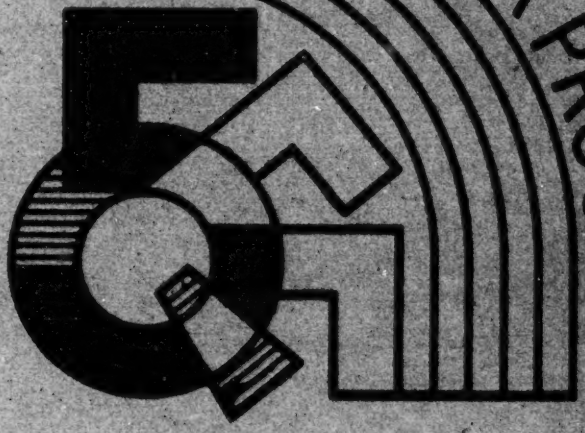
AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM



DADE COUNTY PUBLIC SCHOOLS

Course Outline
MACHINE SHOP WORK - INTERMEDIATE - 9555
(Introduction to Machine Tool Technology)
Department 48 - Quin 9555.01

D A D E C O U N T Y P U B L I C S C H O O L S

1 4 5 0 N O R T H E A S T S E C O N D A V E N U E

M I A M I, F L O R I D A 33132

Course Outline

MACHINE SHOP WORK - INTERMEDIATE - 9555
(Introduction to Machine Tool Technology)

Department 48 - Quin 9555.01

county office of

VOCATIONAL AND ADULT EDUCATION

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Dr. E. L. Whigham, Superintendent of Schools
Dade County Public Schools
Miami, Florida 33132

December, 1972

Published by the School Board of Dade County

Course Description

9555	48	9555.01	Introduction to Machine Tool Technology
State Category Number	County Dept. Number	County Course Number	Course Title

This quinmester course enables the student to gain an understanding of the importance of the machining arts in our society. It stresses the necessity of safety and good work habits. The skill of employing basic measuring instruments, tools, and gages is experienced as the student uses proper layout methods. This is the first quinmester course taken in the first year of vocational machine shop.

Indicators of Success: Students must have been accepted by the school administration and staff.

Clock hours: 135

PREFACE

The following quinmester course outline has been prepared as a guide to assist the instructor to plan systematically, and to present meaningful lessons programmed to meet the necessary training needed by the machine shop student.

This is a beginning course. The four blocks of instruction contained in this outline are designed to enable the student to obtain the manipulative skills and related knowledge necessary to understand and use correctly measuring instruments and layout tools in a safe and productive manner.

The student must be accepted by the school administration and staff before entering into this first quinmester course, which consists of 135 clock hours.

The methods of instruction vary, depending upon the individual ability of the student. When presenting the subject matter an instructor uses demonstrations, lectures, and question/answer techniques. The learning process is further promoted by the use of models, cutaways, diagrams, audiovisual aids, assignment sheets, unit of instruction plans, job sheets, and other types of instructional aids.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the Quinmester Advisory Committee, and the Vocational Curriculum Materials Development, and has been approved by the Dade County Vocational Curriculum Committee.

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with Suggested Hourly Breakdown

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GOALS

The student must be able to demonstrate:

1. Knowledge of the various methods employed in the machining of metals.
2. Proficiency and knowledge in shop safety regulations and work habits.
3. An understanding and ability to correctly use and care for the measuring tools and instruments demonstrated and discussed in this quinmester course.
4. Proficiency in proper and productive layout procedure.

SPECIFIC BLOCK OBJECTIVES

BLOCK I - ORIENTATION

The student must be able to:

1. Demonstrate an understanding of his responsibility to comply with all school and shop regulations and policies pertaining to attendance, safety, and work regulations by successfully completing worksheets.
2. List the criteria to be used by the instructor for evaluation.
3. Demonstrate a familiarization of machine tools, types of metals, hand tools, and use in the machining industry, by listing their use.
4. Demonstrate an understanding of the objectives to promote and develop safety, speed, accuracy of skills, and good judgment by oral discussion.
5. Determine the benefits derived from completing this quinmester course in relation to job opportunities, developing skills, and receiving a certificate, by writing a report.

BLOCK II - INTRODUCTION TO THE MACHINING OF METALS

The student must be able to:

1. Demonstrate an understanding of the important part machine tools play in the growth of civilization, production of goods, and living standards by writing a report.
2. Demonstrate an understanding of various methods used to machine metals, by listing and defining terms.
3. Define the basic controllable machining operations used to cut accurately and to remove metal.
4. List and define the specialized machine tools used in modern industry and high production operations.

BLOCK III - MEASUREMENT AND MEASURING INSTRUMENTS

The student must be able to:

1. Demonstrate an understanding of the need for accurate measurement through oral discussion, and by defining the systems used to control measuring standards.
2. Exhibit the ability to care for and use correctly precision measuring instruments, to inspect dimensionally machined surfaces, and to lay out accurately scribed lines locating predetermined points for machine operation, by completing an assigned work project.

BLOCK IV - QUINMESTER POST-TEST

The student must be able to:

1. Satisfactorily complete the quinmester post-test

Course Outline

MACHINE SHOP WORK - INTERMEDIATE - 9555
(Introduction to Machine Tool Technology)

Department 48 - Quin 9555.01

I. ORIENTATION

A. Student Responsibilities
   1. School policies relative to attendance
   2. Safety regulations
      a. Proper shop clothing
      b. Correct eye protection
      c. Accepted safety practices
   3. Work regulations
      a. Shop fees
      b. Housekeeping
      c. Use and care of equipment
      d. Materials and supplies

B. Criteria for Evaluation
   1. Standards
      a. To complete course
      b. To receive certificate
   2. Methods
      a. Related work
         (1) Written test
         (2) Oral test
         (3) Notebooks
         (4) Textbooks
      b. Manipulative skills
         (1) Projects
         (2) Daily work assignments

C. Familiarization with Shop Equipment, Tools, and Materials
   1. Machine tools
   2. Types of metals
   3. Hand tools
   4. Precision measuring tools

D. Course Objectives
   1. Develop safety consciousness
   2. Encourage cleanliness and orderliness
   3. Develop speed and accuracy
   4. Demonstrate skills and judgment

E. Student Benefits
   1. Development of manipulative skills
   2. Opportunities for employment
      a. Machine operator
      b. General machinist
      c. Tool and die maker apprentice

d. Plastic mold maker apprentice
e. Precision inspector

3. Shop program certificate

II. INTRODUCTION TO THE MACHINING OF METALS

A. Importance of Machine Tools
1. Growth of civilization
2. Production of goods
3. Transportation equipment
4. Reduction of costs
5. Increase in living standards

B. Machining of Metals
1. Cutting and removing metal
2. Shearing and parting
3. Chemical and electrical action
4. Forming

C. Basic Machining Operations
1. Drilling
   a. Making of holes
   b. Reaming
   c. Tapping
2. Turning and boring
   a. Cylindrical shapes
   b. Threading
   c. Faces and shoulders
   d. Finishing and enlarging holes
3. Milling
   a. Horizontal
   b. Vertical
   c. Types of cutters
   d. Cutting action
4. Shaping and planing
   a. Horizontal
   b. Vertical
   c. Angular
   d. Irregular
   e. Broaching
      (1) Internal
      (2) External
5. Grinding
   a. Precision grinding
      (1) Surface
      (2) External cylindrical
      (3) Internal cylindrical
      (4) Thread
      (5) Form
   b. Nonprecision grinding
   c. Lapping
   d. Honing

II. INTRODUCTION TO THE MACHINING OF METALS (Contd.)

D. High Production Machine Tools
   1. Hand screw machine
   2. Turret lathe
   3. Automatic screw machine

E. Numerically Controlled Machine Tools
   1. Two axis point to point
   2. Three axis contour

III. MEASUREMENT AND MEASURING INSTRUMENTS

A. Measuring Principles
   1. Need for accurate measurement
      a. Standarization of parts
      b. Fits and clearances
   2. Linear measurement
      a. English system
         (1) Inches
         (2) Fractions
            (a) Common
            (b) Decimal
      b. Metric system
         (1) Meter
         (2) Decimeter
         (3) Centimeter
   3. Measurement standards
      a. Metal bar
      b. Light waves
      c. International Bureau
      d. U. S. Bureau
   4. Limits and tolerances
      a. Interchangeability
      b. Limitations
      c. Common terms
         (1) Actual size
         (2) Basic size
         (3) Limits of size
         (4) Tolerance
         (5) Fit
         (6) Allowance
      d. Finding tolerances
         (1) Drawings
         (2) Charts
         (3) Specified
         (4) General

B. Measuring Instruments and Gages
   1. Types, care and usage
      a. Rules
      b. Squares

c. Calipers
d. Center gage
e. Radius gage
f. Screw pick gage
g. Micrometers
h. Dial indicators
i. Vernier calipers
j. Hole gages
k. Telescope gages
l. Preset gages

2. Work applications and precautions

C. Layout Work

1. Prepare surface
   a. Blue dykem
   b. Copper sulphate
2. Measure and mark work
   a. Scribe
   b. Combination square
   c. Center head
   d. Height gage
   e. Center punch
   f. Dividers
   g. Trammels
3. Angle layout
   a. Sine bar
   b. Angle plate
   c. Gage blocks
   d. Protractor
   e. V-block
4. Care and use of surface plates
   a. Cast iron
   b. Granite

IV. QUINMESTER POST-TEST

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4. Grinding Cutter Bits. 16 mm. 20 min. Color. Sound. South Bend Lathe Works.

5. Grinding a Parallel Bar. Part I. 16 mm. 14 min. B/W. United World Films, Inc.

6. Hacksaws. 16 mm. 18 min. B/W. Sound. United World Films, Inc.

7. Hammers. 16 mm. 11 min. B/W. Sound. United World Films, Inc.

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12. Micrometer. 16 mm. 15 min. B/W. Sound. United World Films, Inc.

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24. Verniers. 16 mm. 19 min. B/W. Sound. United World Films, Inc.

25. Wrenches. 16 mm. 20 min. B/W. Sound. United World Films, Inc.

A P P E N D I X

Quinmester Post-Test Sample

QUINMESTER POST-TEST

Name _____ Date _____ Score ____

Matching Test Items

The phrases in the left-hand column are the results of the unsafe work situations that are stated in the right-hand column. Match them properly by placing placing the figure preceding the phrase in the left-hand column in the brackets at the right of the matching situation.

1.	Finger and hand part company	a.	Loose clothing or neckties ( )
2.	Skewered for a barbecue	b.	Wearing rings and watches ( )
3.	Scalped by a revolving cutter	c.	Oil or grease on the floor ( )
4.	Broken toe or foot	d.	Revolving shaft blocking aisle ( )
5.	Fire! Fire!	e.	Loose, long hair ( )
6.	Choked to death at a machine	f.	Oily towels in an open box ( )
7.	Damage to machine and body	g.	Improperly placed tools at a work station ( )
8.	Broken leg or head by slipping	h.	Operation of machines without instruction ( )

Multiple Choice Test Items

Each statement needs a word, a figure, or a phrase to make it correct. Only one of the choices listed is correct. Place the letter of the choice you make in the space provided at the left edge of the sheet.

____ 1. Long shirt sleeves should be rolled and kept:

a. Above the elbow
b. Above the wrist
c. Between the wrist and elbow
d. At the shoulders

____ 2. When you have to talk with a person operating a machine you should:

a. Turn off his machine
b. Tap him on the arm
c. Tap him on the back
d. Wait until he stops the machine

___ 3. Do not check a job on a machine while it is in:

a. Gear
b. Motion
c. Poor condition
d. Bad light

___ 4. If you injure yourself, you should:

a. Ignore it
b. Run to the clinic
c. Go home
d. Report to the instructor

___ 5. Safety glasses are worn to protect your eyes from:

a. Loose hair
b. Bright light
c. Flying objects
d. Eye strain

___ 6. Liquid spilled on the floor is wiped up immediately because it:

a. Will spoil the floor
b. Will cause the instructor more work
c. Looks unsightly
d. Will cause someone to slip or fall

___ 7. When a drill is breaking through the metal, it is a safe practice to:

a. Increase the feed
b. Lessen the pressure
c. Apply more oil
d. Stop the drill

___ 8. When using a vise on the drill press to hold a work piece:

a. Clamp the vise to the table
b. Wedge vise against the column
c. Reduce drill speed
d. Hold the vise by hand

___ 9. Always remove chips with:

a. Your fingers
b. An old file
c. A brush
d. A wet cloth

___10. You should not operate a machine until you have had:

a. The blueprint checked
b. Proper instruction
c. A student show you how
d. Your tools checked

____11. The point of a tool bit should be respected when checking the workpiece in order to:

a. Keep the tool sharp
b. Prevent injury to yourself
c. Keep from breaking the tool
d. Prevent marking the work

____12. If you put your hand on a revolving workpiece, you will:

a. Cause it to stop
b. Cut your hand
c. Leave a mark on the work
d. Make the work undersize

____13. The pioneer of assembly-line methods was:

a. Charles Jacobs
b. Joseph Whitworth
c. Henry Ford
d. Eli Whitney

____14. The father of mass production was:

a. William Sellers
b. Eli Whitney
c. L. S. Starrett
d. Henry Ford

____15. The machine which started the Industrial Revolution was:

a. Steam engine
b. Gasoline engine
c. Jet engine
d. Atomic engine

____16. The machining method which uses a multitoothed tool that is fed into or around a fixed workpiece with a single stroke is:

a. Milling
b. Honing
c. Broaching
d. Grinding

____17. The machining operation which uses a revolving multitooth cutter feed into a mooring workpiece is:

a. Shaping
b. Milling
c. Planing
d. Tapping

____18. The country's total production of goods and services is called:

a. American Standards Association
b. U. S. Bureau of Production
c. National Standard of Living
d. Gross National Product

____19. The machining operation which is used to enlarge or finish an already drilled or cast hole is:

a. Drilling
b. Boring
c. Tapping
d. Planing

____20. When a tool is fed longitudinally against a revolving workpiece, the machining operation is called:

a. Lapping
b. Drilling
c. Planing
d. Turning

____21. The machining procedure which involves the use of abrasive paste or compound to obtain a high degree of surface finish is:

a. Grinding
b. Honing
c. Lapping
d. Broaching

____22. The best term to define the making of many like parts is called:

a. Tooling up
b. Mass production
c. Industrial Revolution
d. Gross product

____23. The practical standard of measurement used in machine shops around the world is called a:

a. Step block
b. Light meter
c. Gage block
d. Dial indicator

____24. A combination set consists of the following part or parts:

a. Center head
b. Protractor head
c. Square head
d. All of the preceding

____25. In the English system of measurement, the fraction "one-thousandth inch" may be shown as:

a. 1/10" or 0.1"
b. 1/100" or 0.01"
c. 1/1000" or 0.001"
d. 1/10000" or 0.0001"

____26. The standard micrometer divides the inch into:

a. 10 parts
b. 25 parts
c. 1,000 parts
d. 100 parts

____27. Each numbered division on the sleeve of the micrometer designates the number of:

a. 10 thousandths
b. 25 thousandths
c. 50 thousandths
d. 100 thousandths

____28. The 0.001" graduation marks appear on the part of the standard micrometer which is called the:

a. Spindle
b. Sleeve
c. Thimble
d. Frame

____29. A special scale on the sleeve of some micrometers permits measurements to 1/10,000th of an inch. That scale is called:

a. Metric
b. Decimal
c. Vernier
d. Fractional

____30. The part of the micrometer which allows the proper touch control sensitivity is called:

a. Ratchet stop
b. Thimble
c. Spindle
d. Anvil

____31. Each of the lines on the sleeve of the micrometer represents a travel of:

a. .010"
b. .015"
c. .020"
d. .025"

____32. The micrometer operates on one of the following principles:

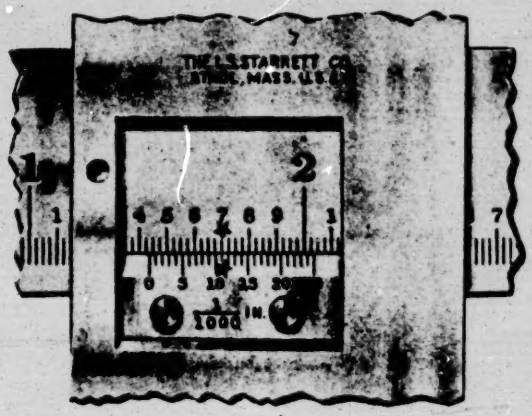
a. Gear and rack travel
b. Screw-thread-pitch movement
c. Pulley diameter change

____33. A precision tool for determining angles with extreme accuracy is called a:

a. Gage block
b. Protractor
c. Sine bar
d. Planer gage

Completion Test Items

Study each of the scales shown on the micrometers, vernier calipers, and dial-indicating instruments, and record their reading in the blank provided.



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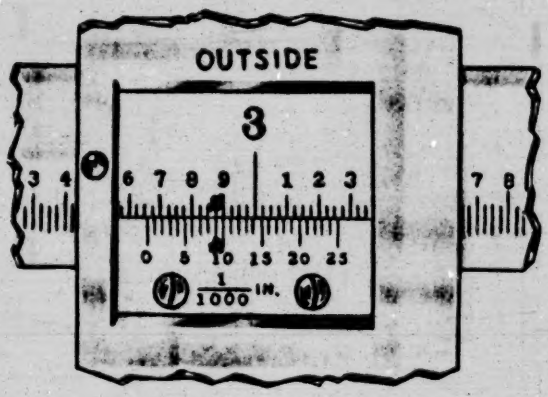

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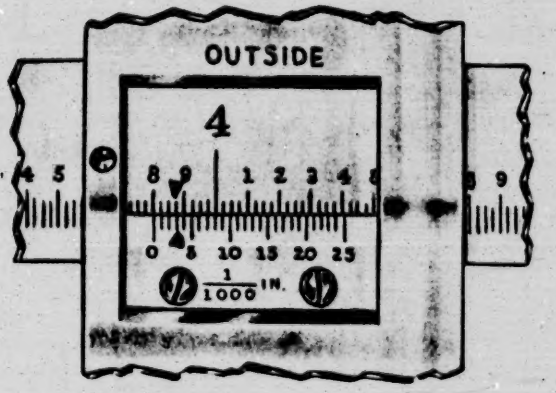

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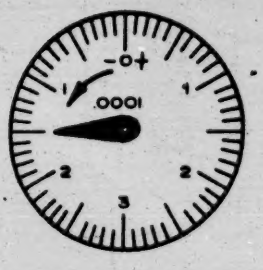

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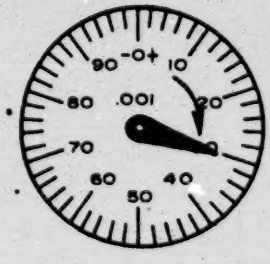

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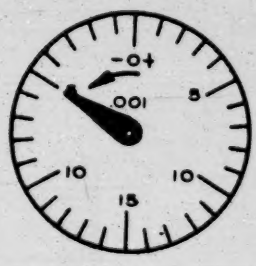

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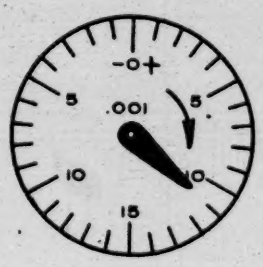

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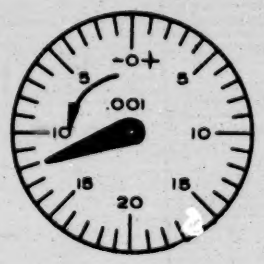
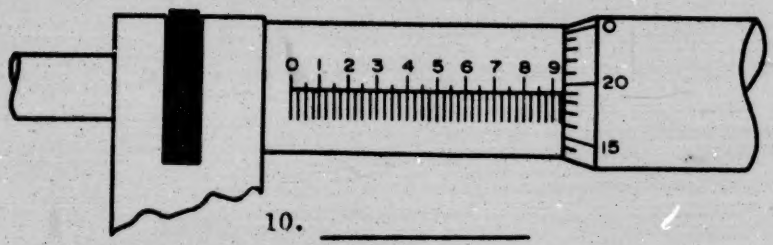


9. _____



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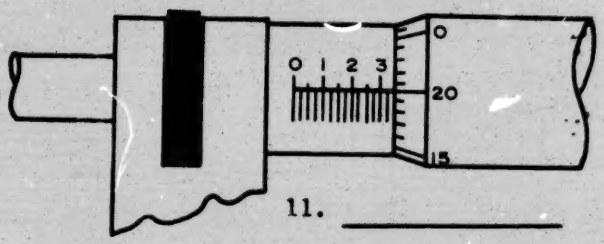

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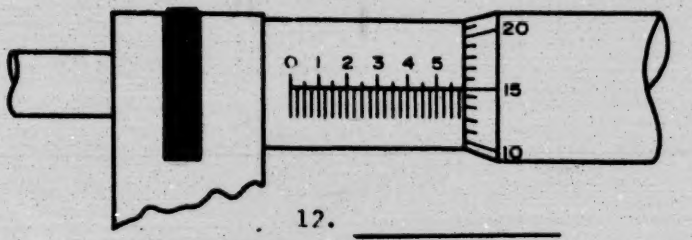

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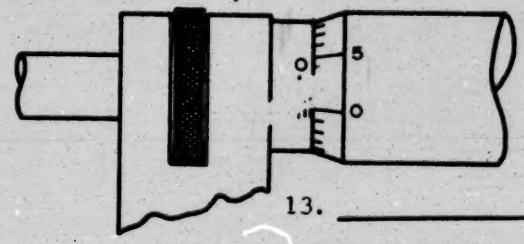

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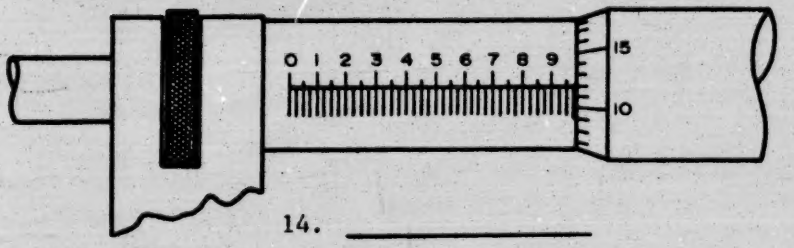

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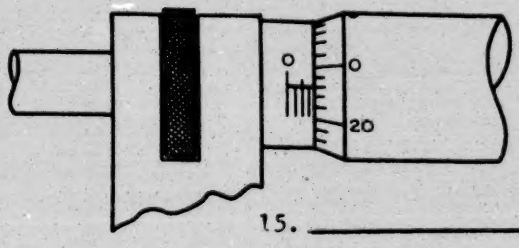

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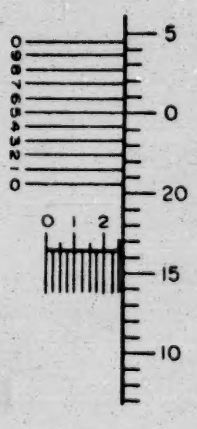

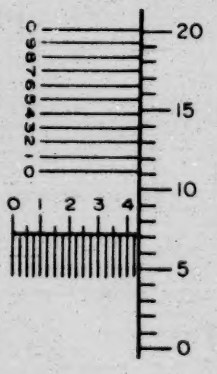

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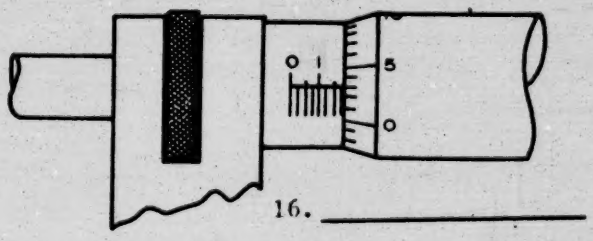
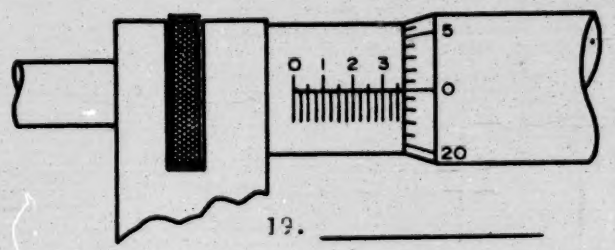


16. _____

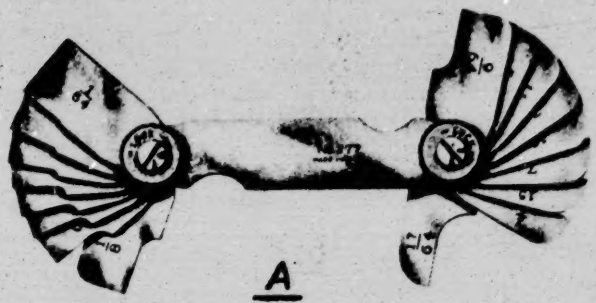
17. _____



19. _____

Matching Test Items

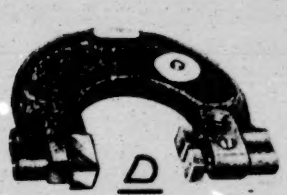
Identify the lettered tools (A-H) illustrated below by writing the letter in front of the name that identifies the tool.



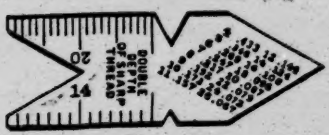
A

B

C



D



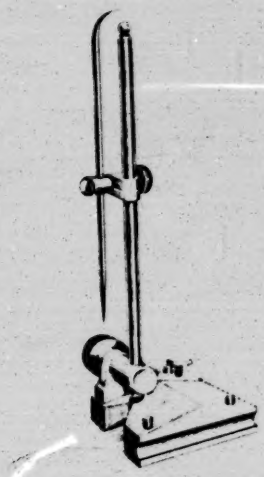
E

F

G

H

I



J

___ 1. Center gage

___ 2. Snap gage

___ 3. Radius gage

___ 4. Planer gage

___ 5. Screw pitch gage

___ 6. Vernier height gage

___ 7. Surface gage

___ 8. Prick punch

___ 9. Telescoping gage

___ 10. Center punch

ANSWER KEY TO QUINMESTER POST-TEST

Matching Test Items

a. 6
b. 1
c. 8
d. 2
e. 3
f. 5
g. 4
h. 7

Multiple Choice Test Items

1. a
2. d
3. b
4. d
5. c
6. d
7. b
8. a
9. c
10. b
11. b
12. b
13. c
14. b
15. .
16. c
17. b
18. d
19. b
20. d
21. c
22. b
23. c
24. d
25. c
26. c
27. d
28. c
29. c
30. a
31. d
32. b
33. c

Completion Test Items

1. 1.436
2. 2.659
3. +.054
4. 3.803
5. -.0015
6. +.030
7. -.005
8. +.011
9. -.012
10. .944
11. -.345
12. .590
13. .052
14. .987
15. .098
16. .178
17. .2665
18. .4322
19. .375

Matching Test Items

1. E
2. D
3. A
4. C
5. B
6. F
7. C
8. G
9. I
10. H